

**AMENDMENTS TO THE CLAIMS**

1. (Original): A speech coder comprising:

- a spectral parameter calculating unit supplied with a speech signal for calculating and quantizing spectral parameters;
- an adaptive codebook unit for calculating a delay and a gain from a preceding quantized excitation signal by the use of an adaptive codebook, predicting the speech signal, and calculating a residue; and
- an excitation quantizing unit for quantizing an excitation signal of said speech signal by the use of said spectral parameters to produce an output;

said speech coder further comprising:

- a judging unit for extracting a feature from said speech signal to judge a mode;
- a codebook for representing the excitation signal by a combination of a plurality of nonzero pulses and simultaneously quantizing amplitudes or polarities of said pulses in case where the output of said judging unit is a predetermined mode;
- said excitation quantizing unit for searching combinations of code vectors stored in said codebook and a plurality of shift amounts for shifting pulse positions of said pulses and producing as an output a combination of the code vector and the shift amount, the produced combination minimizing distortion from an input speech; and
- a multiplexer unit for producing a combination of the output of said spectral parameter calculating unit, the output of said judging unit, the output of said adaptive codebook unit, and the output of said excitation quantizing unit.

2. (Cancel)

3. (Original): A speech coder comprising:

a spectral parameter calculating unit supplied with a speech signal for calculating and quantizing spectral parameters;

an adaptive codebook unit for calculating a delay and a gain from a preceding quantized excitation signal by the use of an adaptive codebook, predicting a speech signal, and calculating a residue; and

an excitation quantizing unit for quantizing an excitation signal of said speech signal by the use of said spectral parameters to produce an output;

said speech coder comprising:

a judging unit for extracting a feature from said speech signal to judge a mode;

a codebook for representing the excitation signal by a combination of a plurality of nonzero pulses and simultaneously quantizing amplitudes or polarities of said pulses in case where the output of said judging unit is a predetermined mode and a gain codebook for quantizing the gain;

said excitation quantizing unit for searching combinations of code vectors stored in said codebook, a plurality of shift amounts for shifting pulse positions of said pulses, and gain code vectors stored in said gain codebook, and producing as an output a combination of the code vector, the shift amount, and the gain code vector, the produced combination minimizing distortion from an input speech; and

a multiplexer unit for producing a combination of the output of said spectral parameter calculating unit, the output of said judging unit, the output of said adaptive codebook unit, and the output of said excitation quantizing unit.

4. (Cancel)

5. (Original): A speech coder comprising:

spectral parameter calculating means supplied with a speech signal for calculating and quantizing spectral parameters;

adaptive codebook means for calculating a delay and a gain from a preceding quantized excitation signal by the use of an adaptive codebook, predicting a speech signal, and calculating a residue;

mode judging means for extracting a feature quantity from said speech signal and carrying out mode judgment as to the utterance or the silence and so on;

excitation quantizing means for quantizing an excitation signal of said speech signal by the use of said spectral parameters to produce an output, said excitation quantizing means searching, in case of a predetermined mode, combinations of code vectors stored in a codebook for simultaneously quantizing amplitudes or polarities of a plurality of pulses and a plurality of shift amounts for temporally shifting predetermined positions of the pulses and selecting a combination of the index of the code vector and the shift amount, the selected combination minimizing distortion from an input speech;

gain quantizing means for quantizing the gain by the use of a gain codebook; and

multiplexer means for producing a combination of the outputs of said spectral parameter calculating means, said adaptive codebook means, said excitation quantizing means, and said gain quantizing means.

6. (Original): A speech coder as claimed in claim 5, wherein:

said excitation quantizing means uses, as the pulse positions, positions generated in accordance with a predetermined rule in case where judgment by said mode judging means indicated a predetermined mode.

7. (Original): A speech coder as claimed in claim 5, further comprising:  
random number generating means for generating a predetermined number of pulse positions, said random number generating means delivering said positions thus generated to said excitation quantizing means in case where judgment by said mode judging means indicates a predetermined code.

8. (Original): A speech coder as claimed in claim 5, wherein:  
said excitation quantizing means selects, from all combinations of every code vectors in said codebook and every shift amounts for the pulse positions, a plurality of combinations in the order of minimizing a predefined distortion and delivers the combinations to said gain quantizing means, in case where judgment in said mode judging means indicates a predetermined mode;

said gain quantizing means quantizing the gain by the use of said gain codebook for each of a plurality of sets of the outputs supplied from said excitation quantizing means and selecting a combination of the shift amount, the excitation code vector, and the gain code vector, the combination minimizing the predetermined distortion.

9. (Original): A speech coder as claimed in claim 5, wherein said mode judging means uses a pitch prediction gain as the feature quantity of said speech signal, compares the value of the pitch prediction gain calculated for each subframe and a predetermined threshold value, and judges the utterance and the silence when the pitch prediction gain is greater and smaller than said threshold value, respectively.

10. (Original): A speech coder as claimed in claim 5, wherein said predetermined mode is silence.

11. (Original): A speech coding/decoding apparatus including:

a speech coder comprising:

a spectral parameter calculating unit supplied with a speech signal for calculating and quantizing spectral parameters;

an adaptive codebook unit for calculating a delay and a gain from a preceding quantized excitation signal by the use of an adaptive codebook, predicting a speech signal, and calculating a residue;

an excitation quantizing unit for quantizing an excitation signal of said speech signal by the use of said spectral parameters to produce an output;

a judging unit for extracting a feature from said speech signal to judge a mode;

a codebook for representing the excitation signal by a combination of a plurality of nonzero pulses and simultaneously quantizing amplitudes or polarities of said pulses in case where the output of said judging unit is a predetermined mode;

said excitation quantizing unit for searching combinations of code vectors stored in said codebook and a plurality of shift amounts for shifting pulse positions of said pulses and producing as an output a combination of the code vector and the shift amount, the produced combination minimizing distortion from an input speech; and

a multiplexer unit for producing a combination of the output of said spectral parameter calculating unit, the output of said judging unit, the output of said adaptive codebook unit, and the output of said excitation quantizing unit;

demultiplexer means supplied with a coded output of said speech coder for demultiplexing the coded output into codes representative of spectral parameters, delays of said adaptive codebook, adaptive code vectors, excitation gains, amplitudes or polarity code vectors as excitation information, and pulse positions and delivering these codes;

mode judging means for judging a mode by the use of a preceding quantized gain in an adaptive codebook;

excitation signal restoring means for generating, in case where the output of said mode judging means is a predetermined mode, pulse positions in accordance with a predefined rule, generating amplitudes or polarities of said pulses from the code vectors, and restoring an excitation signal; and  
a synthesis filter unit for passing said excitation signal to reproduce a speech signal.

12-15. (Cancel)